

Power flux density measurements of certain N-GSO satellites of the EESS in the frequency band 8025- 8450 MHz

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Outlines

- ⇒ Memorandum of Understanding
- ⇒ The Monitoring Earth Station in Leeheim
- ⇒ Monitoring of Earth Exploration Satellites
 - Aqua and Terra
 - Envisat
 - Spot-5

Memorandum of Understanding

- ⇒ Satellite monitoring
 - Highly specialized activity
 - Cost a lot of money
- ⇒ Agreement to set up a European cooperation framework based on the Monitoring Earth Station in Leeheim for satellite monitoring
 - A MoU has been signed by 6 CEPT administrations : Germany, France, The Netherlands, Switzerland, the United Kingdom and Spain.
 - The European monitoring fund of the MoU is used to perform measurements campaigns in support to CEPT

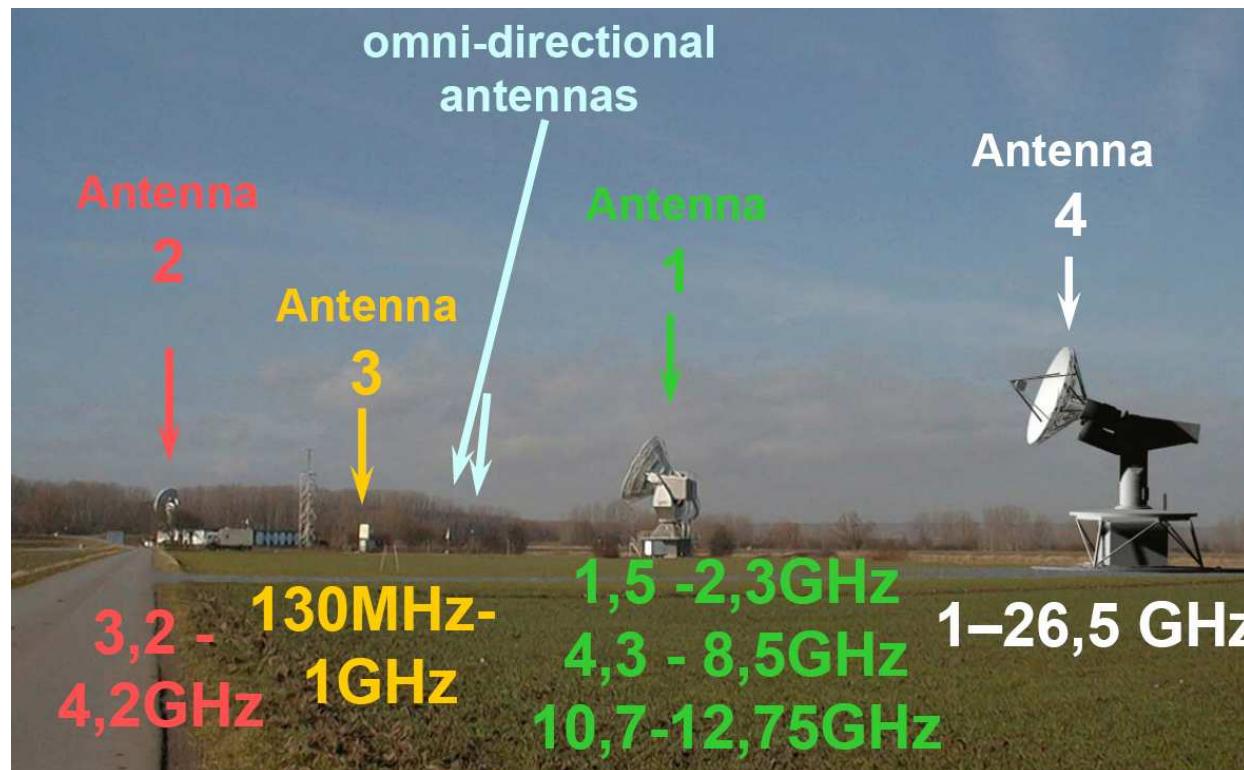
Memorandum of Understanding

⇒ Scope of the MoU

- Monitoring of the compliance of technical characteristics to those registered at the ITU
- Regular and systematic observation of the radio-frequency spectrum
- Determination of transponder occupancy and percentage of occupation or detection of paper satellites
- Investigation of harmful interference
- Measurements in conjunction with introduction of new space radio communication applications in order to ensure the compatibility with existing services
- Measurements and recording for technical and scientific projects
- Pre-launch monitoring

Monitoring Earth Station Leeheim

- ⇒ Location : Leeheim, Germany, $49^{\circ}51' N$, $8^{\circ}23' E$
- ⇒ Visible geostationary arc : $67^{\circ}W$ to $83^{\circ}E$
- ⇒ Contact : Peter Dondl (Peter.Dondl@regtp.de)



Monitoring Earth Station Leeheim

⇒ Antenna 1 :

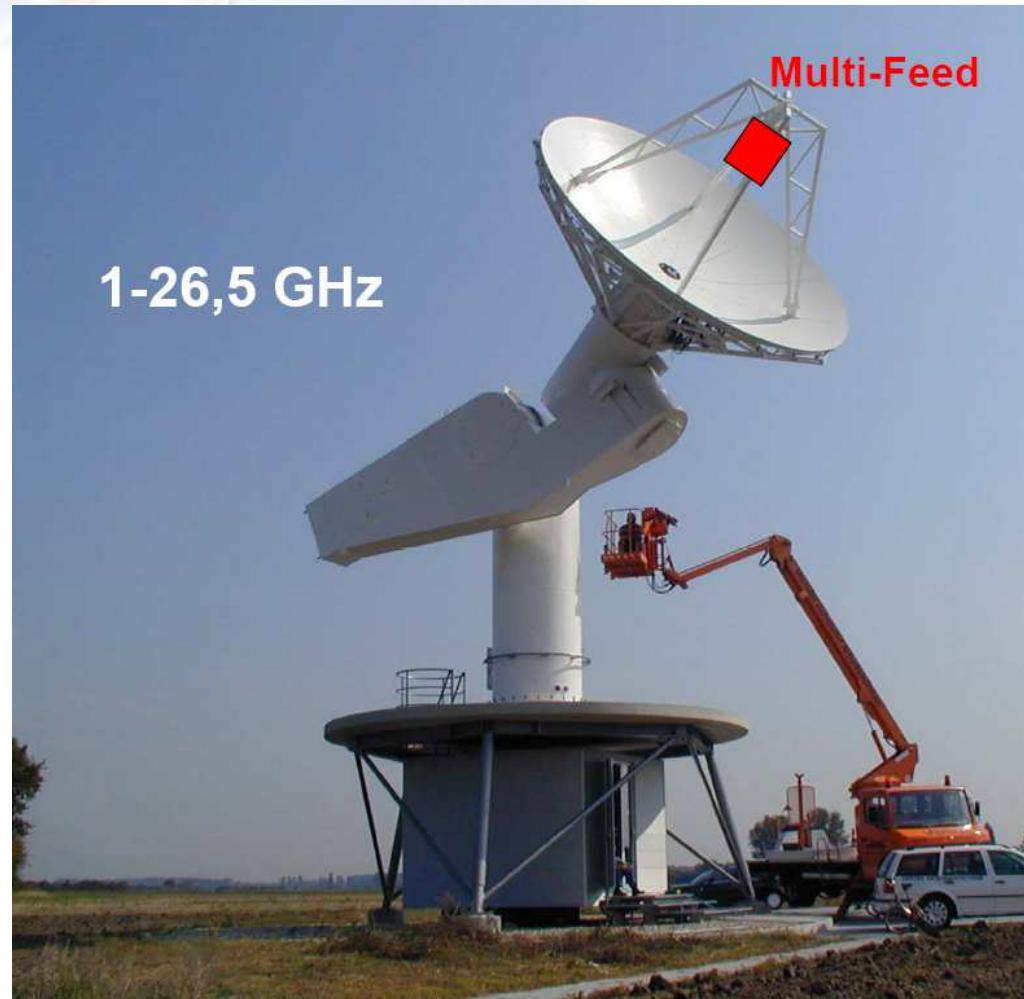
- Cassegrain type
- Diameter : 12m
- 44 to 61 dBi
- 17 to 34 dBK⁻¹
- Three frequency bands
 - ◆ 1.5 to 2.3 GHz
 - ◆ 4.3 to 8.5 GHz
 - ◆ 10.7 to 12.75 GHz
- Measurement accuracies
 - ◆ PFD ±1.5 dB
 - ◆ Frequency 10⁻⁹



Monitoring Earth Station Leeheim

⇒ Antenna 4 :

- Direct feed
- Diameter : 7m
- 32 to 58 dBi
- 12 to 34 dBK⁻¹
- 1 to 26.5 GHz
- Measurement accuracies
 - ◆ PFD ±1 dB
 - ◆ Frequency 10⁻⁹



Monitoring Earth Station Leeheim

Some remarks :

- ⇒ 4 kHz filters are not available in Leeheim. All the PFD measurements are taken in 30 kHz and then the values are calculated to the required bandwidths.
- ⇒ Power measurement devices used to estimate the maximum PFD are accurate within an uncertainty of 1,5 dB
- ⇒ A less accurate method have been used to obtain the fluctuations of PFD and EIRP versus elevation : uncertainty in the order of ±3 dB.



Monitoring of Earth Exploration Satellites

The following measurements have been performed during summer 04 in support of CEPT SE 40 :

- spectra in the 8025-8400 MHz EESS band,
- power flux density in dBWm⁻²/4 kHz in the 8025-8400 MHz EESS band,
- received power versus elevation angle,
- power flux density in dBWm⁻²Hz⁻¹ in the 8400-8450 MHz deep space exploration band.

for the satellites AQUA (NASA), ENVISAT (ESA), IRS-P4 (ISRO), SPOT-5 (CNES) and TERRA (NASA).

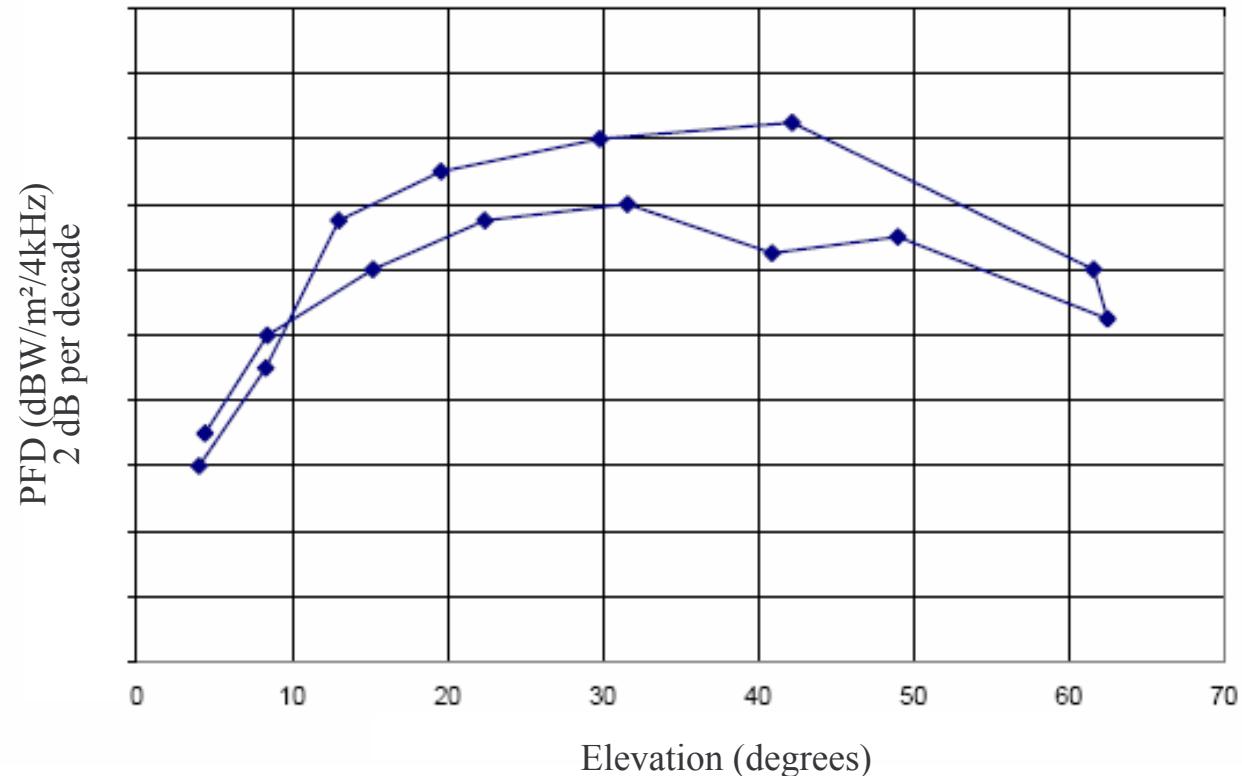
- ⇒ No emissions have been observed for IRS-P4
- ⇒ In the deep space exploration band (8400-8450 MHz), no detectable unwanted emissions are recorded down to a sensitivity of -178 dBWm^{-2} in 4 kHz (-214.2 dBW/Hz)

Monitoring of Earth Exploration Satellites

satellite	Frequency (MHz)	Date	elevation (degrees)	PFD max / RR Art. 21 (dBWm ⁻² /4kHz)
TERRA	8215,5	21.07.04/19:24	11	-150,5 / -147
TERRA	8215,5	21.07.04/19:21	9	-155,5 / -148
ENVISAT	8100,0	29.07.04/20:43	15	-139,0 / -145
ENVISAT	8100,0	29.07.04/20:40	54	-152,5 / -150
ENVISAT	8200,0	29.07.04/20:43	15	-156,0 / -145
ENVISAT	8200,0	29.07.04/20:40	54	-152,5 / -150
ENVISAT	8300,0	29.07.04	-	-
AQUA	8160,0	29.07.04/10:43	12	-153,5 / -146,5
AQUA	8160,0	29.07.04/10:48	11	-165,0 / -147
SPOT-5	8253,0	21.07.04/10:41	17	-152,0 / -144
SPOT-5	8365,0	21.07.04/10:41	17	-152,5 / -144

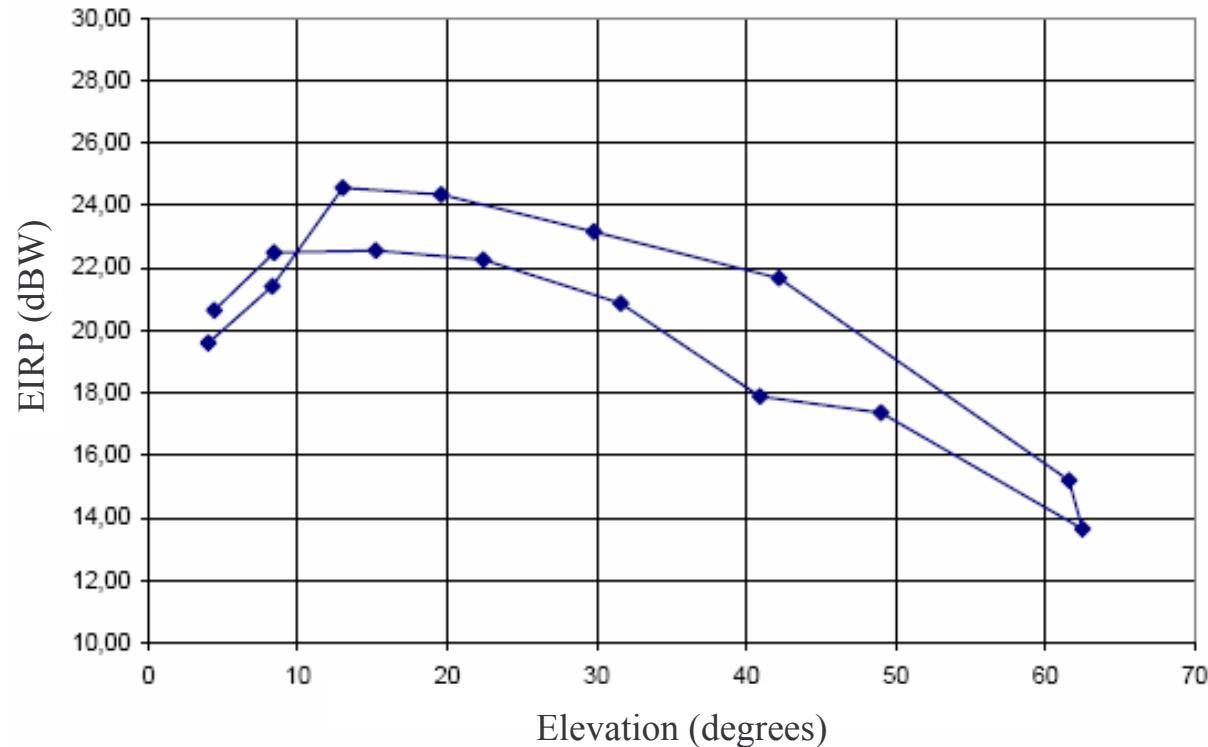
Monitoring of Terra

TERRA, Revolution 24429, 21.07.2004



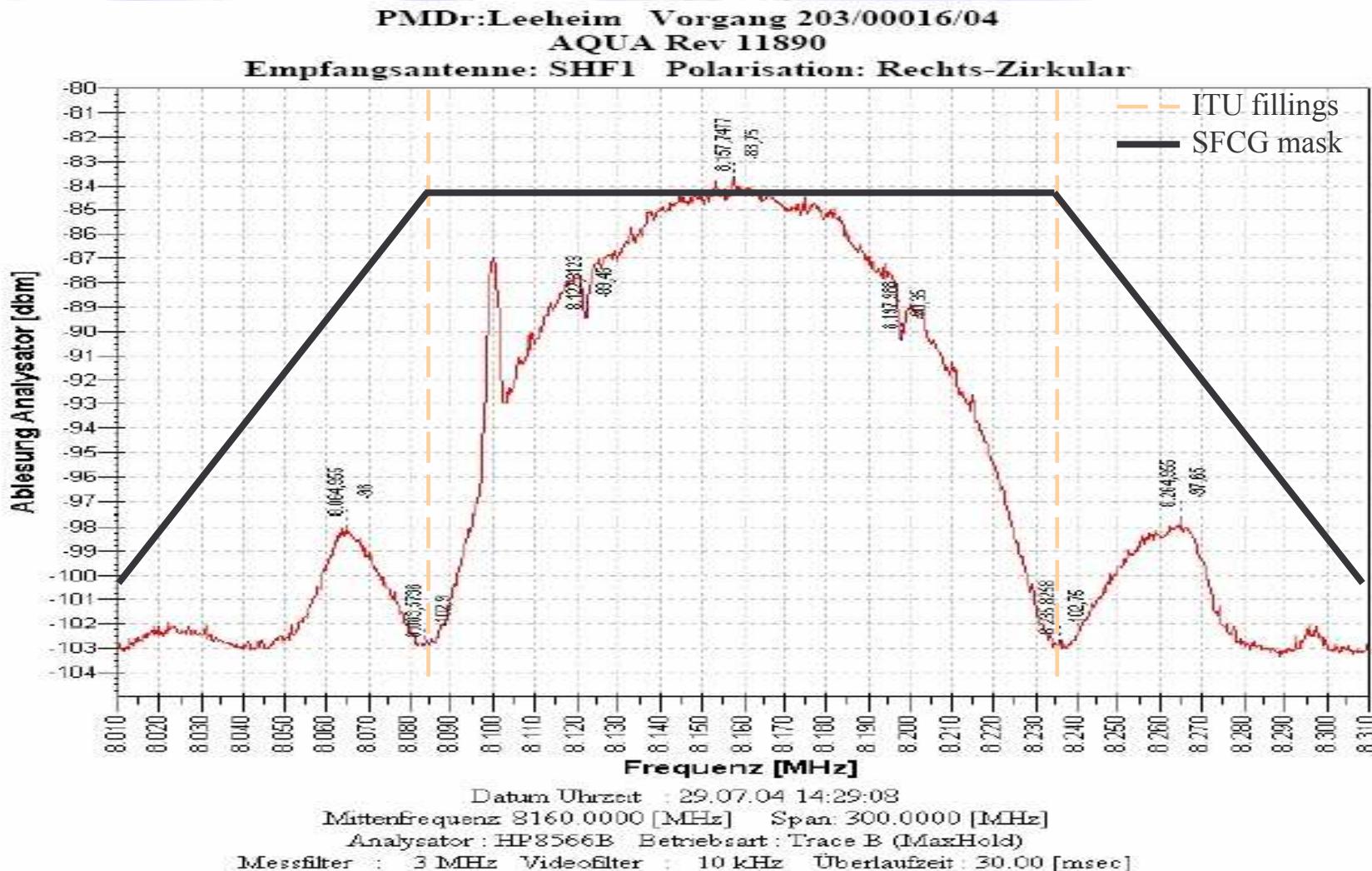
Monitoring of Terra

TERRA, Revolution 24429, 21.07.2004

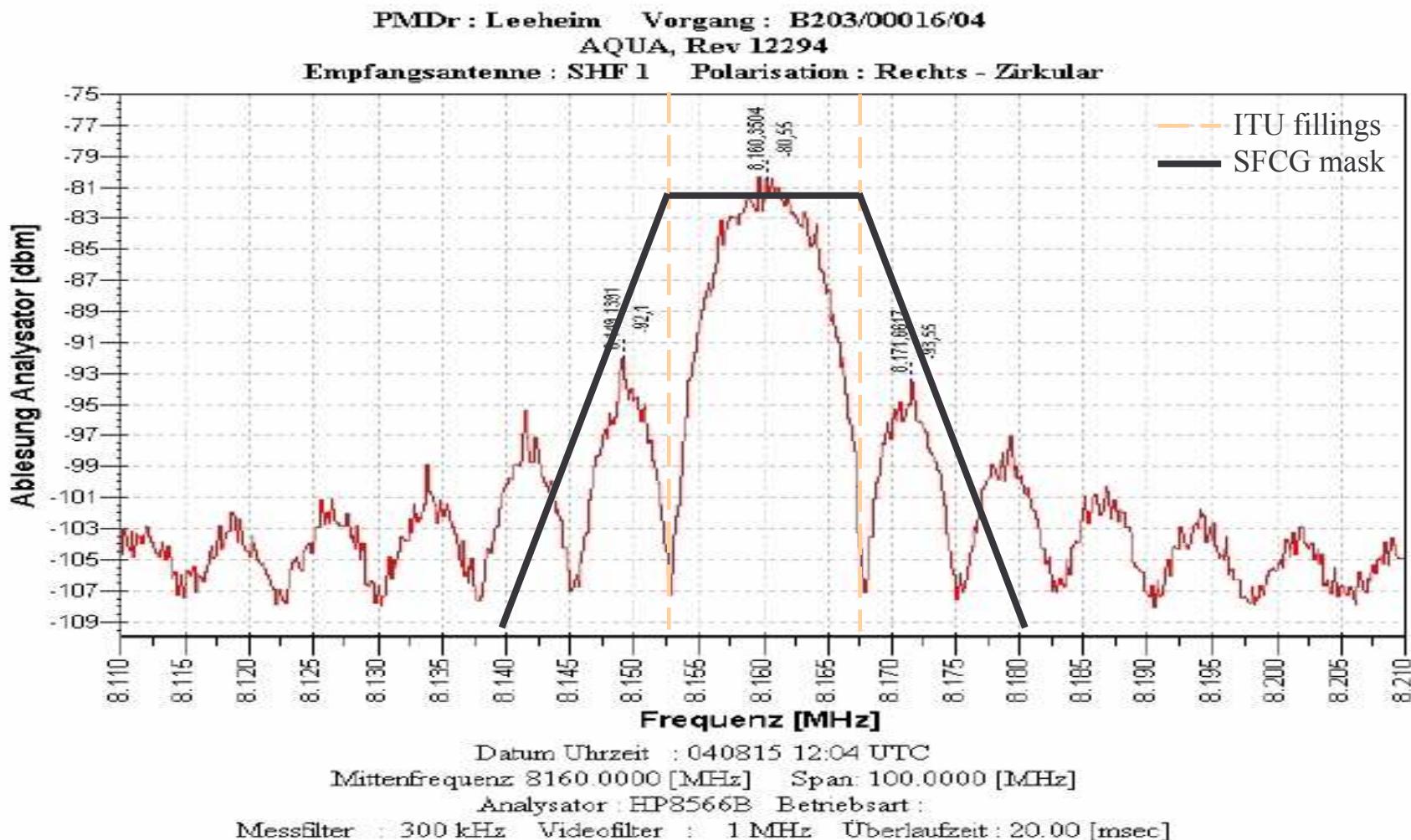


The in-axis EIRP given in the SFCG data base is 17.6 dBW and
the on-board antenna is cardioïd

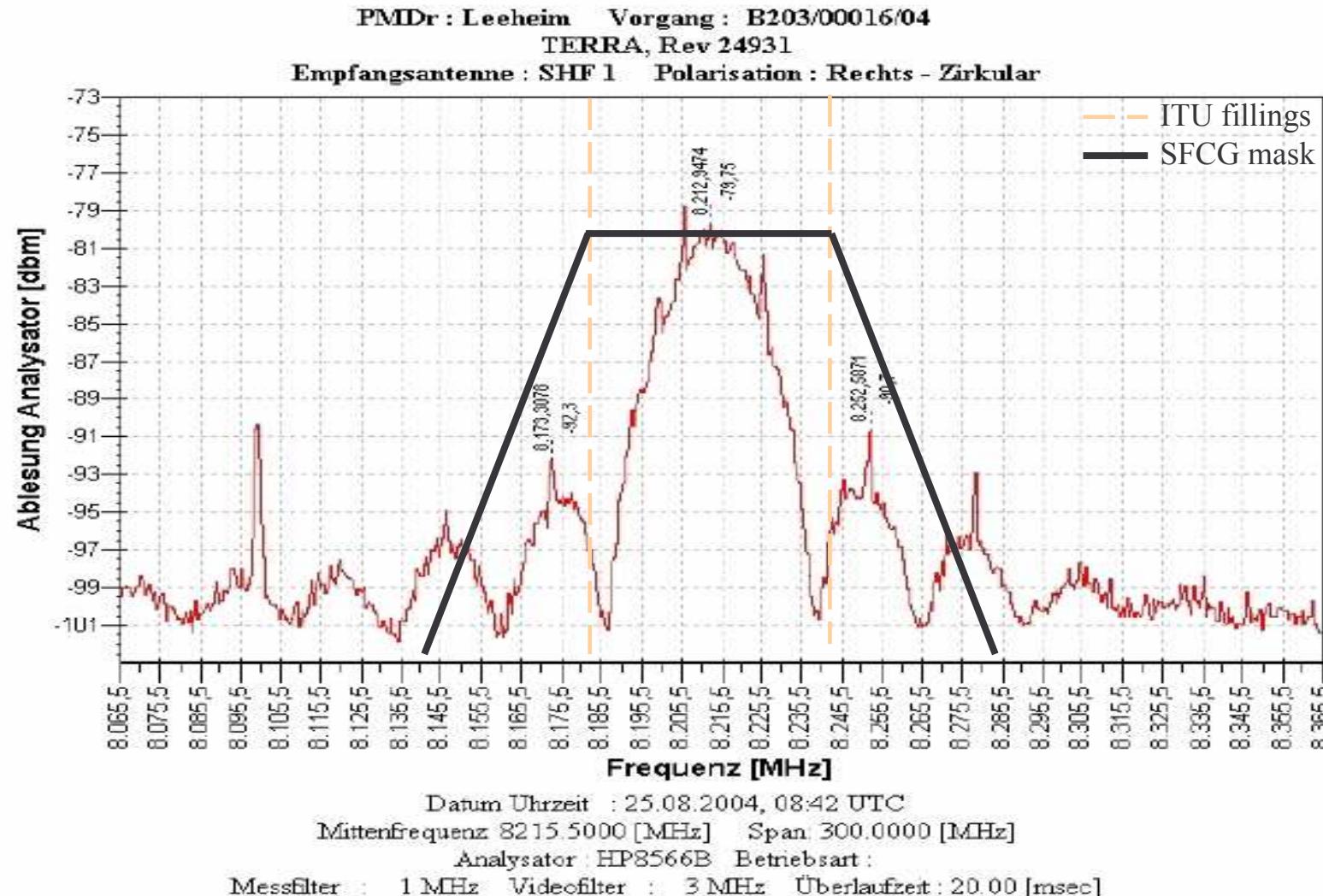
Monitoring of Aqua and Terra



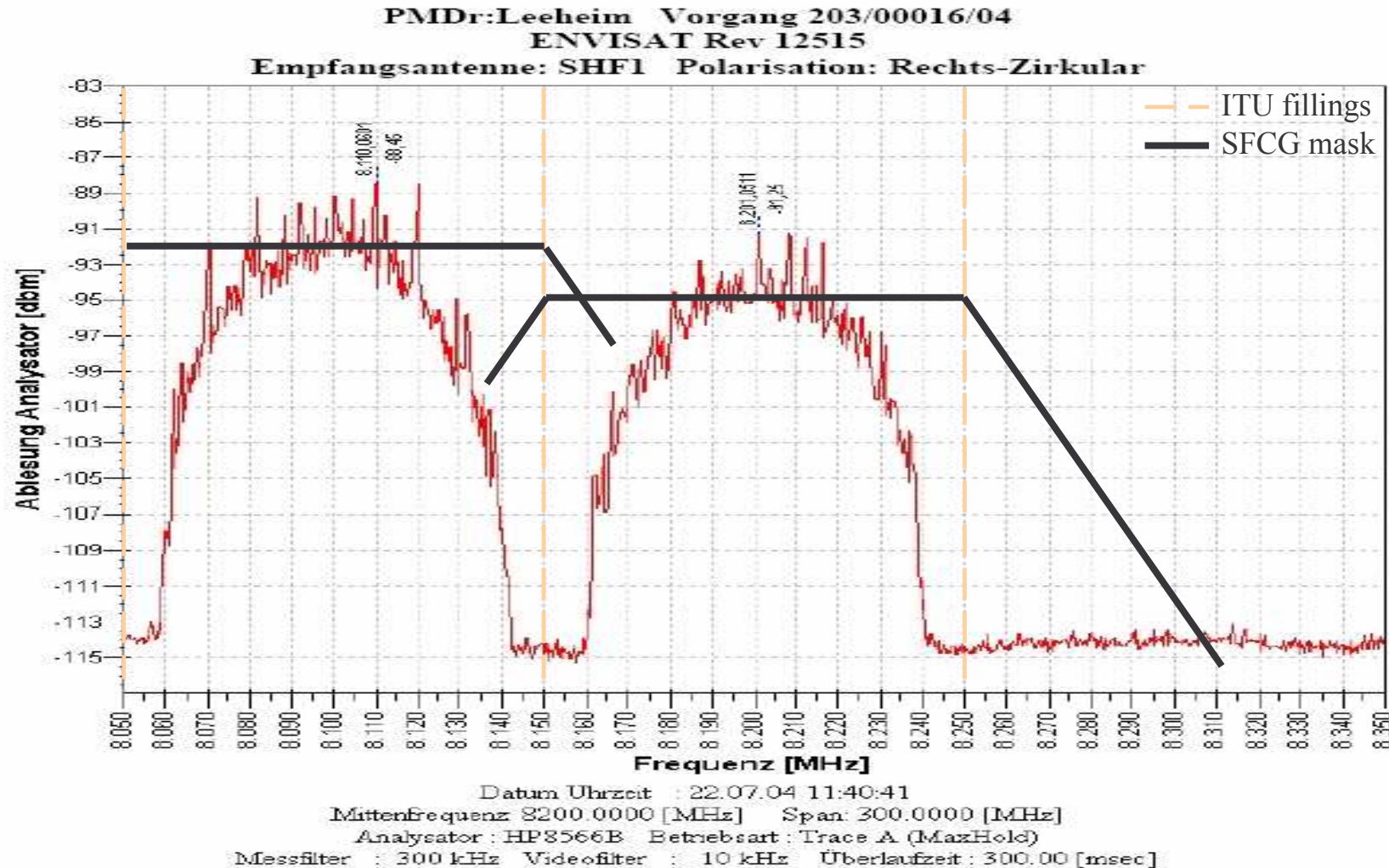
Monitoring of Aqua and Terra



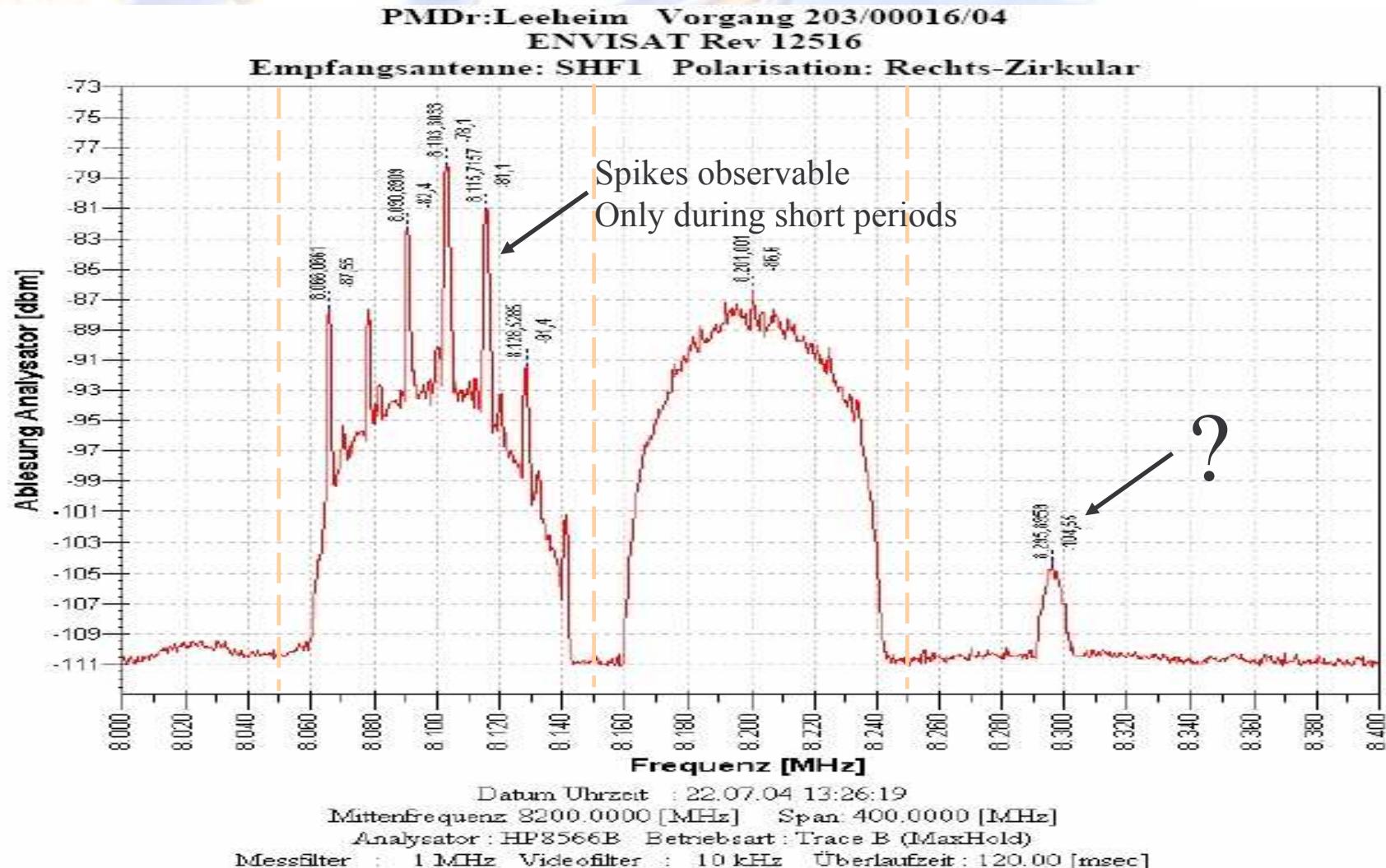
Monitoring of Aqua and Terra



Monitoring of Envisat

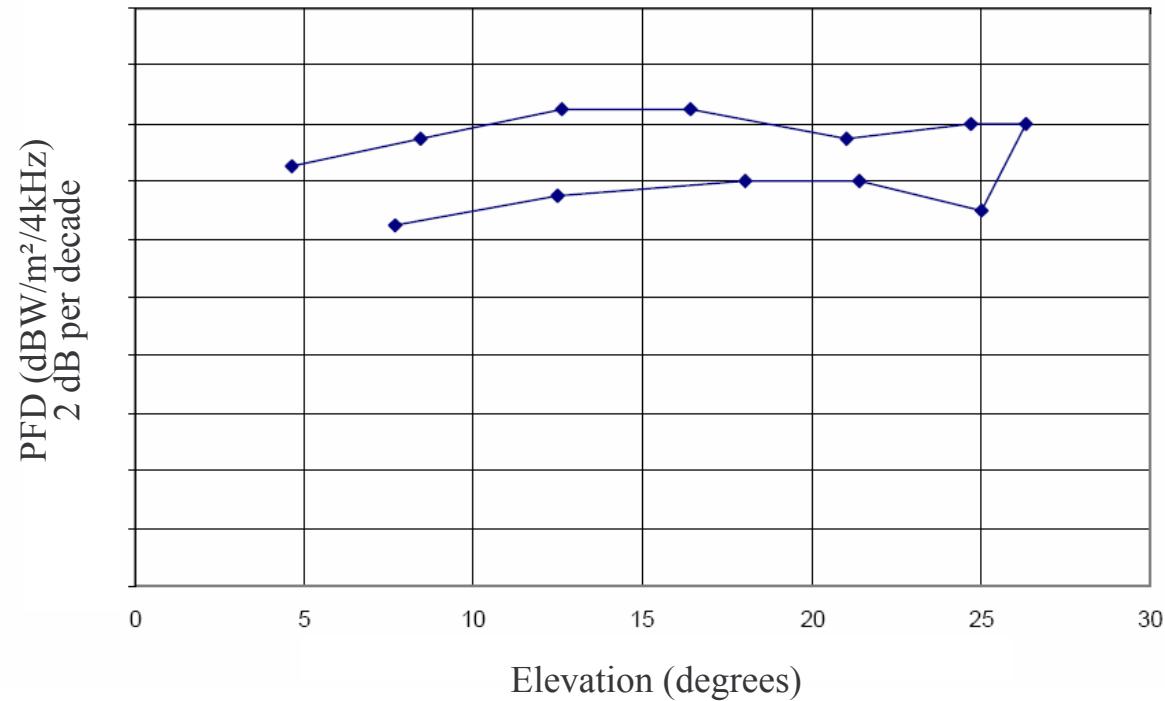


Monitoring of Envisat



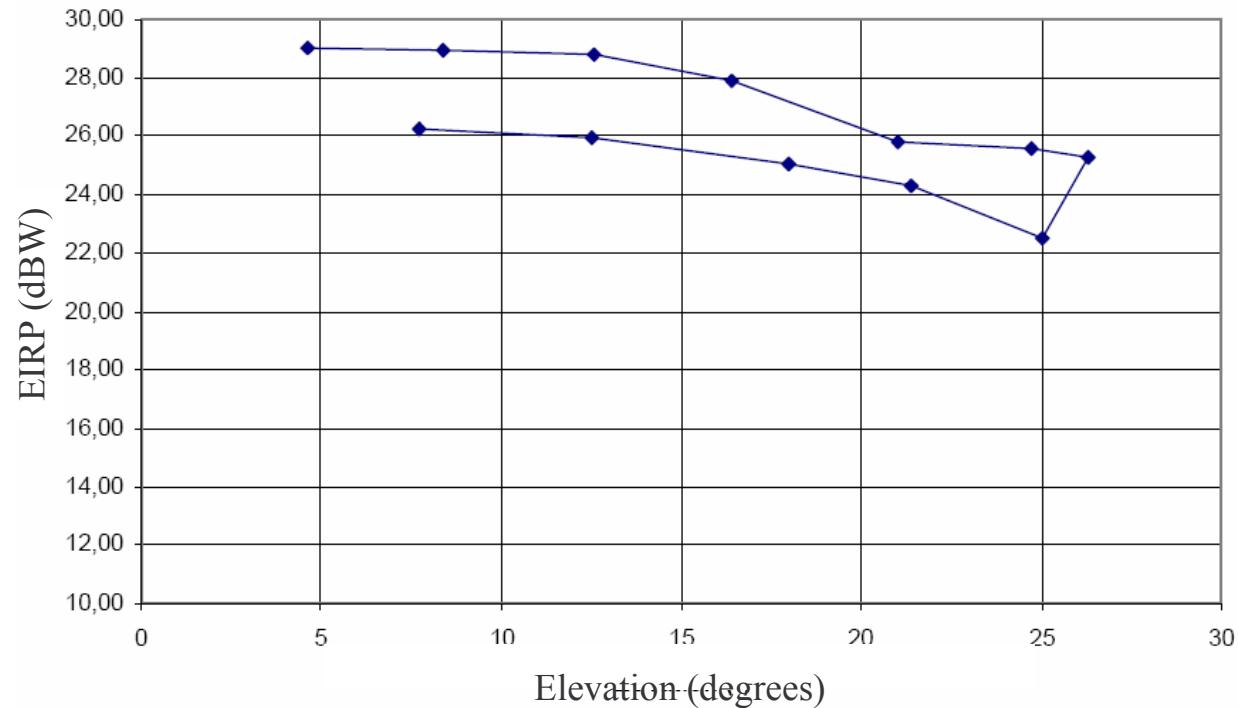
Monitoring of Spot-5

SPOT-5, Revolution 12281, 15.09.2004



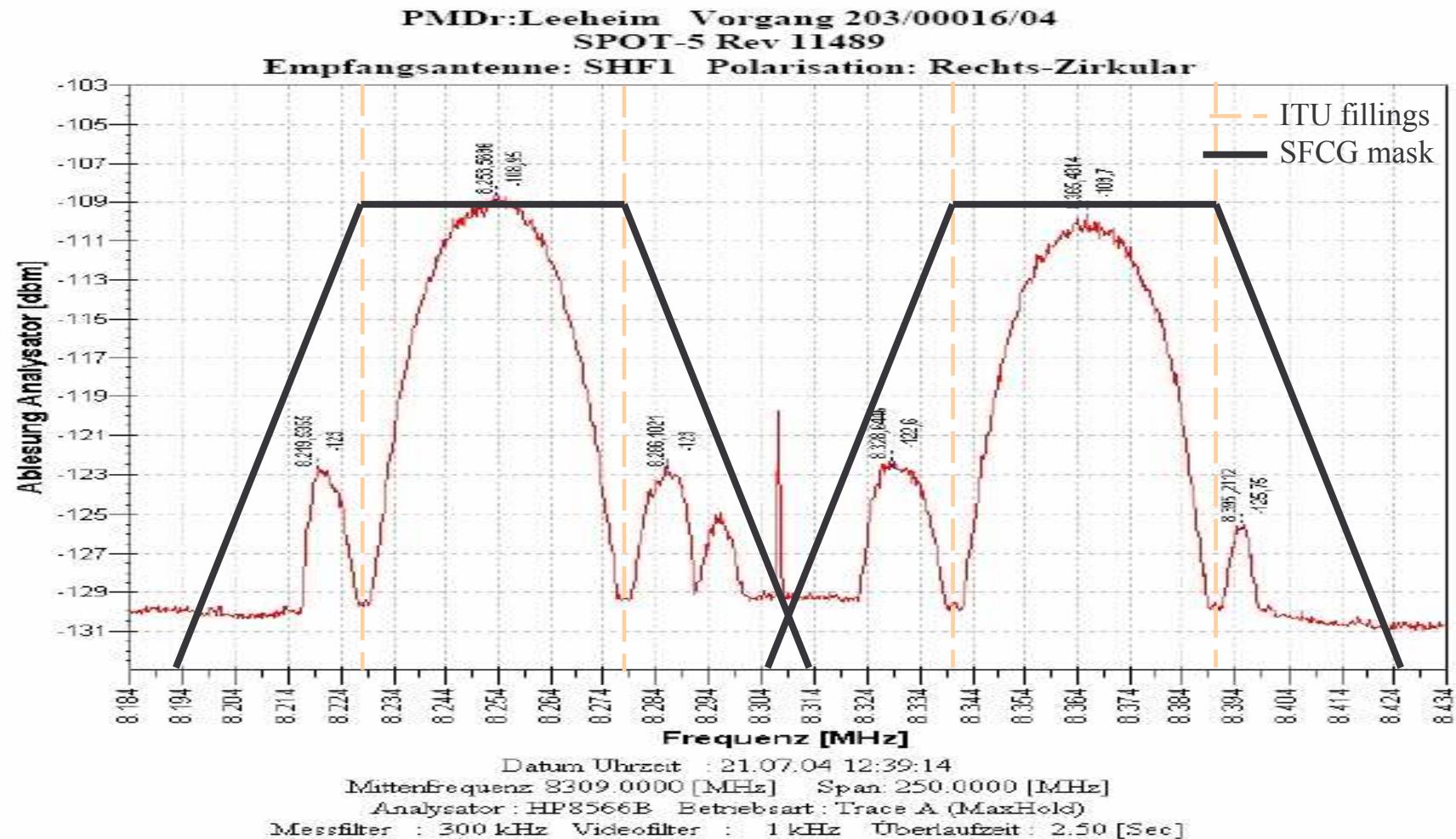
Monitoring of Spot-5

SPOT-5, Revolution 12281, 15.09.2004



The in-axis EIRP given in the SFCG data base is 19 dBW and the on-board antenna is cardioïd

Monitoring of Spot-5





Backup slides

The Leeheim Earth Station

⇒ Antenna 2 :

- Cassegrain type
- Diameter : 8.5m
- 49 dBi
- 28 dBK^{-1}
- 3.2 to 4.2 GHz
- Measurement accuracies
 - ◆ PFD $\pm 1.5 \text{ dB}$
 - ◆ Frequency 10^{-9}



The Leeheim Earth Station

⇒ Antenna 3 :

- Omni directional
- $2.4 \times 2.4 \text{ m}^2$
- 130 MHz to 1 GHz
- Measurement accuracies
 - ◆ PFD $\pm 1.5 \text{ dB}$
 - ◆ Frequency 10^{-9}

